



## PATTERNS OF FOOD CONSUMPTION AND NUTRIENT INTAKES OF SENIOR HIGH SCHOOL STUDENTS IN ACCRA, GHANA

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### Abstract

The nutritional needs of adolescents are unique and demand special attention. Changes in lifestyle and food habits of adolescents affect both nutrient intake and needs. The objective of this study was to investigate. In a cross-sectional survey, patterns of food consumption and nutrient intake of 313 Senior High School students aged 14-18 years were studied using a combination of methods. The results revealed that major foods consumed daily were fish (90.4%), rice (74.8%), fruits (63.3%), roots/tubers (47.3%) and plantain (45.4%). Most of the students did not meet their energy and nutrients requirements except for iron, niacin and vitamin C. Calcium intake was particularly low with intakes for males and females being 264 mg and 243mg respectively. It is recommended that nutrition education programs should target adolescents in Senior High Schools in order to increase their knowledge on food nutrients and its importance to the body. This is of much importance as habitual inadequate intake of calories and nutrients might adversely affect their growth and development.

**Keywords:** Adolescents, food consumption patterns, nutrient intakes.

### 1. Introduction

The nutritional needs of adolescents are unique and demand special attention. These nutritional requirements are needed for building and maintenance of new body tissue, the higher levels of physical activity and to some extent, the interrelated intrinsic and environmental factors, such as, emotional changes, as the adolescent re-acts to his or her maturation and surrounding (Spear, 2002; Sturdevant and Spear, 2002). Adolescents need additional calories to provide energy for growth and activity. The recommended range of energy for adolescents takes into account the needs of growth rate, levels of exercise, age and gender. The protein requirements of adolescents also increase due to the growth and development. Calcium and phosphorus, the main constituents of bone, must be adequately provided for normal skeletal development, and iron is needed for the synthesis of haemoglobin and for the prevention of impaired cognitive development (Williams, 1993). Water soluble vitamins are needed for energy metabolism and for the maintenance of structural and functional properties of new cells which are gained during growth. Thiamin, niacin and riboflavin are needed in greater amounts because they play important roles in the metabolic process (Whitney and Rolfes, 2002). Vitamin A is essential for growth, development and sexual maturation (Herbeth *et. al*, 1991).

The adolescent is considered especially vulnerable nutritionally because there is an increased demand for nutrients related to dramatic increase in physical growth and development. Moreover, changes in lifestyle and food habits of adolescents affect both nutrient intakes and needs. Nutritional vulnerability is partly due to adolescents being under the control of their parents and other members of society, and do not have absolute control over their food intake. Practices commonly found among adolescents which set the stage for dietary inadequacy include small poorly chosen breakfast or omitted breakfasts, inadequate lunches eaten away from home, choice of food left to the adolescent without guidance, failure to eat enough eggs, meat, vegetables and fruit. Others are expenditure of school lunch money on candy and soft drinks which constitute a substitution of empty calories for what might have been a well balanced diet (Mahan and Escott-Stump, 2000). Research conducted in both developed and developing countries shows that adolescents' food choices are not meeting their nutritional needs (WHO, 2005). A study conducted on dietary practices of adolescents in Malaysia and Singapore revealed that the dietary practices of adolescents were less than ideal. Due to their busy schedules, peer pressure, independent nature and self identity searching, adolescents sometimes skipped meals, ate only snacks, tried unconventional meals and consumed excessive amounts of fast foods, soft drinks, alcohol or dieted to the extreme (WHO, 2005). Similarly, in a study on adolescent dietary practices in Ghana, Lansah (2007) reported that adolescents have poor dietary practices. While some skipped meals especially breakfast, others practiced excessive snacking. In general, most of the adolescents ate fewer servings of grains, vegetables, fruits and dairy products than the recommended. Although this study was undertaken using students in only one school in a town in Ghana, and may not be representative of the general adolescent population in Ghana, it is an indication for a possible problem that need further investigation on a wider scale. Dietary habits developed during adolescence could be carried into adulthood. Given the many health implications of adolescent nutrition later in life, there is the need to study dietary intakes of adolescents so as to be able to offer proper counselling. Unfortunately, adolescent nutrition has not received much attention in Ghana. This study was therefore conducted to assess patterns of food consumption as well as nutrient intakes among adolescents in senior high schools in Ghana.

## 2. Method

### 2.1 Study design, Setting and Sampling

The study, which was a cross-sectional survey involving 313 Senior High School students aged 14-18 years, investigated the food consumption patterns and nutrient intakes of adolescents in Senior High School Institutions in Accra, Ghana. The study was conducted in the Ga-East Municipality of the Greater Accra Region of Ghana. In order to have a fair representation of all adolescents in the senior high schools in the municipality, 4 schools were purposively selected based on their location in the Municipality. The total number of students who qualified for the study and were willing to participate were 940. To determine the sampling frame (k), the method  $N/n = k$ , where  $N$ =Total population and  $n$ =sample size was used ( $k=940/313$ ). With a sampling frame of 3, a systematic random sampling technique was used to select every other 3<sup>rd</sup> person on each school's list.

### 2.2 Data Collection and Analysis

A pre-tested questionnaire consisting of three sections was used to collect information on background characteristics of the respondents, patterns of food consumption and nutrient intakes. The food frequency questionnaire, consisting of food items from the 6 food groups in Ghana, was used to assess frequency of consumption of foods from the different food groups. The food groups were starchy roots and plantain; cereals and grains; animal products; beans, nuts and oily seeds; fruits and vegetables; fats and oils. Respondents were required to tick the frequency of consumption of foods; whether on daily or weekly basis, occasionally or never. The 24-hour dietary recall method was used to determine the energy and nutrient intakes of the respondents. The energy and nutrient contents of the foods consumed were converted into quantitative and analysed using the Ghana Food Composition Tables (FRI, 1975) and ESHA-FPRO software (version 6.2). The Recommended Nutrient Intakes by WHO/FAO (2003, 2004) was used as the reference data. Mean nutrient intakes and percentages of RNI were generated to evaluate the adequacy of the diets. All data were analyzed using Statistical Package for Social Sciences (SPSS 11.0).

### 2.3 Ethical Consideration

The study protocol was approved by the Institutional Review Board of the Noguchi Memorial Institute for Medical Research, University of Ghana, Legon (Ethical Identification Number NMIMR-IRB CPN 003/10-11). Informed Consent was also obtained from the Heads and students of participating schools, after the purpose and significance of the study had been fully explained to them.

## 3. Results and Discussion

### 3.1 Frequency of food intakes from the six food groups of Ghana

#### 3.1.1 Staples (Cereals and Grains; Starchy roots and plantain)

The mean daily consumption of the staples is presented in Figure 1. Of the cereals and grains, rice and maize were the most frequently consumed on daily basis. Rice consumed was mainly boiled and served as fried rice, rice balls, *waakye* (rice and beans boiled together) and plain boiled rice served with soup, stew, sauce or *shito* (black pepper sauce). Rice was also eaten in the form of porridge at breakfast. Maize was consumed primarily in the form of *kenkey* (maize meal traditionally prepared by boiling balls of fermented maize dough wrapped in corn husks or plantain leaves), *banku* (fermented maize meal mixed with cassava dough and cooked into a smooth consistent paste) and as porridge. This pattern of consumption corroborates the findings of Lansah (2007) on eating habits of adolescents in the Eastern Region of Ghana. She reported that rice and maize were the most popular staples eaten on daily basis by almost all the respondents. The high consumption of cereals and grains was expected since they form the bulk of the staple food eaten by most Ghanaians. The frequency of consumption of starchy roots and plantain by respondents was not encouraging. Cassava (47%) in the form of *gari* (fried grated cassava grits), and potatoes (45%) were those highly consumed by the respondents on daily basis. Potatoes were consumed because it was the only food mostly fried on the campuses during lunch breaks. It was eaten as lunch with hot pepper sauce and fried fish. *Gari* was consumed mainly soaked with roasted groundnuts and sugar, with or without milk. It was also eaten with pepper sauce.

#### 3.1.2 Animal Source Foods and Legumes

The frequency of consumption of animal source foods and legumes by the respondents is presented in Figure 2. Fish, milk and eggs were the main sources of animal protein consumed daily by most of the students. Fish was mainly consumed as accompaniment to major staples in the form of soups, stews and sauces. Milk and eggs were mainly consumed with cereal porridge and beverage as breakfast. This is encouraging because milk and eggs supply calcium and protein which adolescents need to meet their growing demand for these nutrients. Consumption of poultry and meat was very low, probably due to the high cost of these animal source foods in Ghana. Although groundnut and beans (black-eye cowpeas) were the most frequently consumed legumes on daily basis, the levels consumed were very low. The beans were consumed mainly as boiled beans with *gari*, fried ripe plantain or as *waakye* whiles groundnuts were consumed in the roasted form with roasted maize as snacks. Legumes contain relatively high amounts of proteins, calcium and zinc. Habitual inadequate intake may affect levels of these nutrients in the diet.

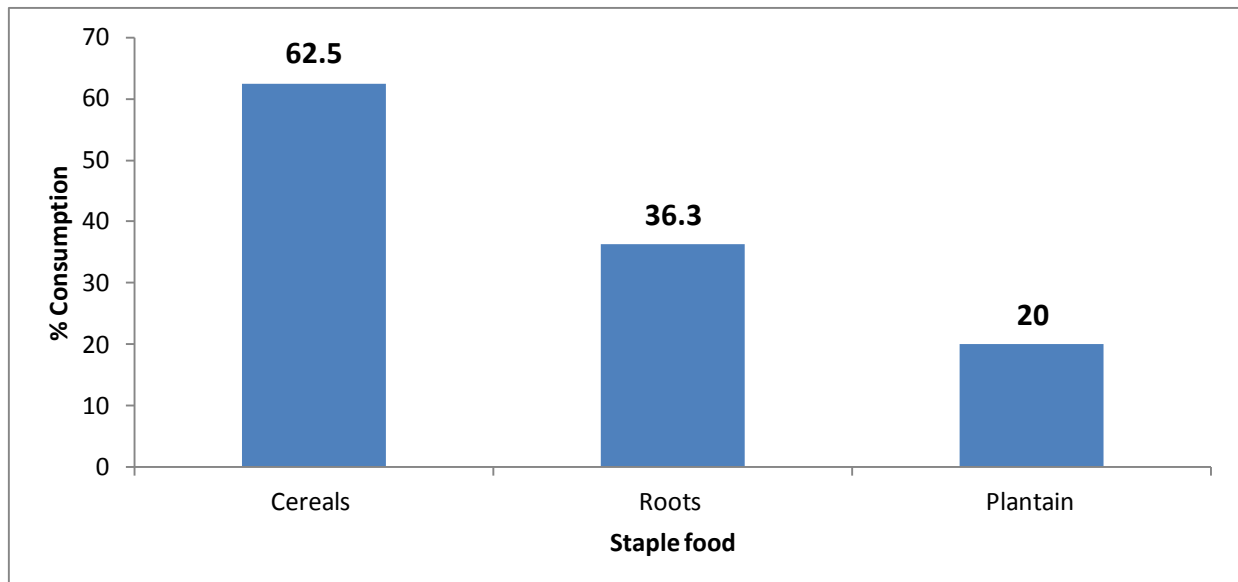


Figure1. Mean daily consumption of staples.

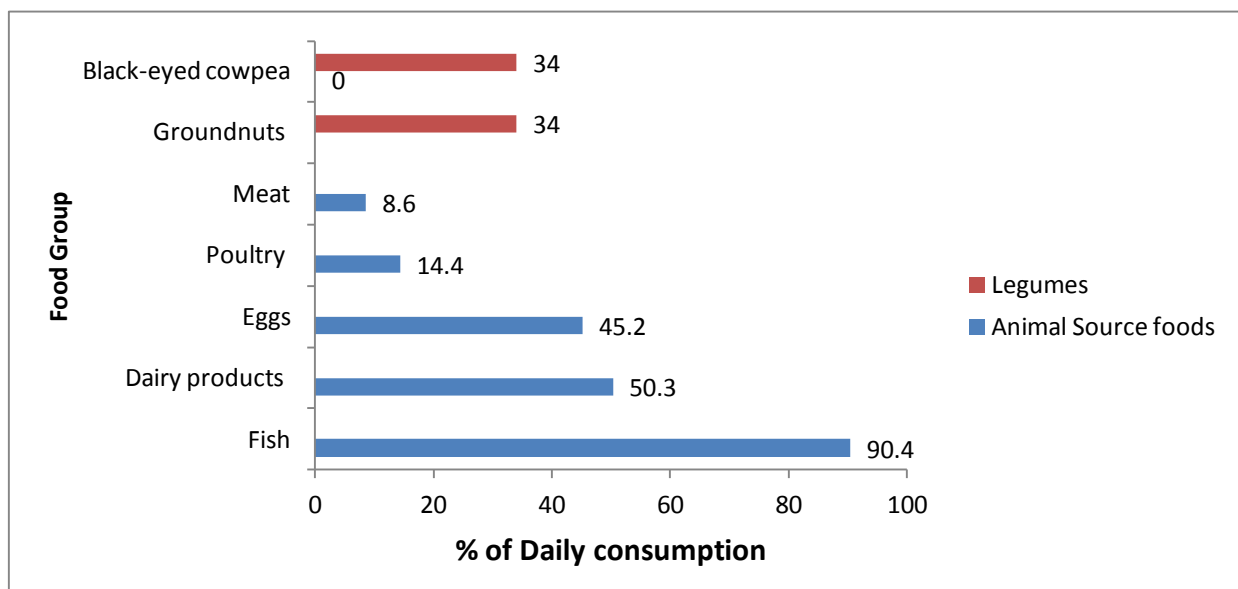


Figure 2. Daily consumption of animal source foods and legumes.

### 3.1.3 Fruits, Vegetables, Fats and oils and other Miscellaneous

The average frequency of consumption of foods from these groups is shown in Figure 3. Of the fruits, oranges were the most consumed, with more than half (63.3%) of the respondents consuming it on daily basis. Others included banana (29.4%), pawpaw (13.1%), apples (13.2%) and pineapples (6.3%). With respect to vegetables, onions (97%) and tomatoes (99%) were consumed on daily basis by almost all the respondents mainly in soups, stews, and sauces. These were eaten as accompaniments to *kenkey*, *banku*, cooked cereals and grains, tubers and plantains as well as *gari*. Green leafy vegetables were the least consumed among the group on daily basis. This might be due to the limited types of food that it is usually eaten with.

Among the fats and oils, palm oil (40.3%) and refined cooking oil (45.2%) were the most frequently consumed. Palm oil was used in stews and also served as accompaniment to cooked beans. It was also consumed as part of palm soup. Palm oil is a rich source of pro-vitamin A which plays an important role in the regulation of the metabolic cell structure and also in the generation of visual purple or rhodopsin. Coconut oil which has been documented as being high in cholesterol was less frequently consumed (7.7%). This is encouraging because high cholesterol intake could lead to cardiovascular diseases (Wardlaw and Kessel, 2002). The most popular beverages consumed on daily basis were fruit juices and cocoa drinks. Toffee (36.9%), ice cream (40.4%) and pastries (64.6%) were also consumed on daily basis by the respondents.

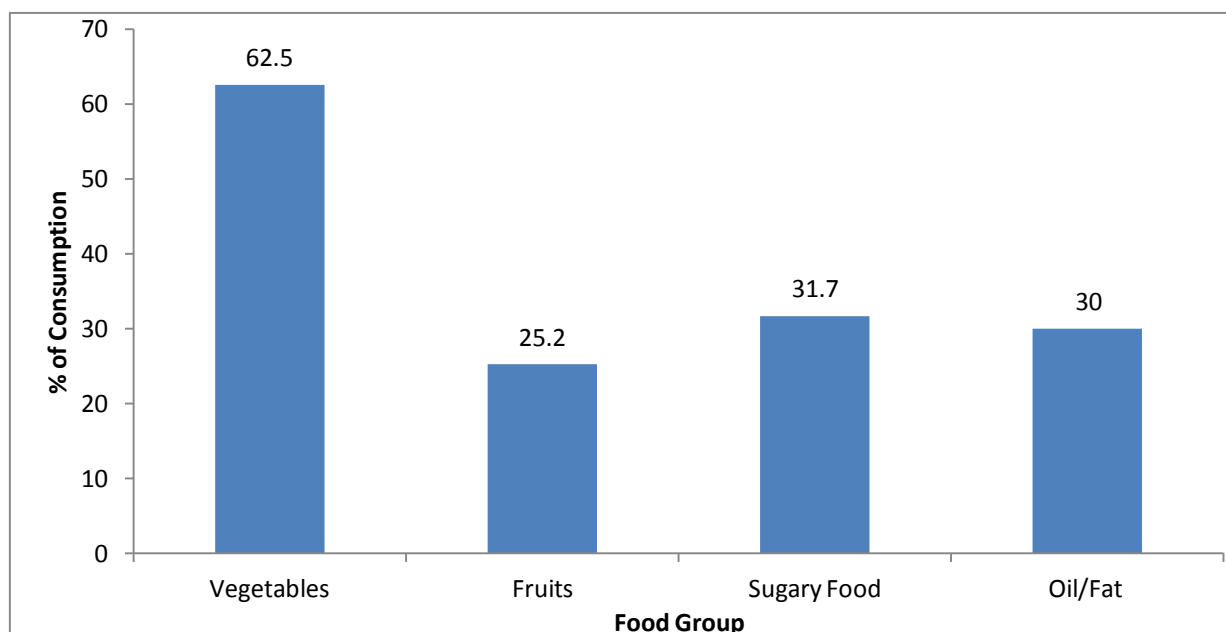


Figure 3: Daily consumption of vegetables, fruits and other foods.

### 3.2 Energy and Nutrient Intakes of Respondents

The average daily intakes of the participants for energy and nutrients are presented in Table 1. The findings indicated that both males and females did not meet their requirements for energy and most nutrients except for iron, niacin and vitamin C.

#### 3.2.1 Energy

The mean daily energy intake for males and females were 1629 kcal and 1615 kcal respectively, representing 54.3% and 73.3% of the recommended intake. This finding could be attributed to the generally low intake of the energy-giving foods especially the staples among the respondents. The staple foods are rich sources of carbohydrate and hence energy in the Ghanaian diet. Inadequate intake would lead to reduced caloric intake. Adequate energy intake is essential for vital body processes like basal metabolism and physical activity. Adequate energy intake would also spare proteins for more important functions like hormone and enzyme production and building of tissues instead of energy generation (Insel and Roth, 2004).

Table 1. Mean Energy and Nutrient Intakes by Sex of Respondents

Nutrient	Male			Female		
	Mean	RNI*	%RNI	Mean	RNI*	%RNI
Calorie(kcal)	1629±800	3000	54.3	1615±120	2200	73.4
Protein (g)	39.1±2.2	44	89.6	35.4±2.1	39	93.2
Calcium (mg)	264±27.7	1300	20.3	243±21.7	1300	18.7
Iron (mg)	9.1±5.1	7.7	118	9.0±6.4	7.9	113.9
Zinc (mg)	6.1±3.6	8.5	71.8	6.0±3.9	7.3	82.2
Vitamin A <sup>#</sup>	333±42.6	630	48.6	264±40.7	485	69.2
Thiamin(mg)	0.9±0.5	1.1	81.8	0.9±0.4	1.3	53.8
Riboflavin(mg)	0.6±0.5	1.3	46.2	0.7±0.6	1.3	53.9
Niacin (mg)	12.3±6.1	12	102.5	11.0±5.1	11	100
Vitamin C(mg)	65±3.9	63	103.2	74±4.5	56	132.1

\*WHO/FAO (2003, 2004); <sup>#</sup> Vitamin A is measured in microgram retinol equivalent

#### 3.2.2 Macronutrients

Although the females' intake of protein (93.2% of RNI) was slightly higher than the males (89.6% of RNI), they both did not meet their recommended intake. This was surprising because according to the food frequency, fish was consumed on daily basis by most of the respondents. The difference could be attributed to the quantities of fish consumed. Legume consumption was also low among the participants. Since animal sources of protein are expensive in Ghana, there is the need to encourage increased consumption of legumes (which are relatively cheaper) among the adolescents to increase the intake of protein given the important role it plays in growth and development.

Calcium intake was the lowest of all the nutrient intakes. Intake for males and females were 264 mg and 243mg respectively far below recommendations. Optimal calcium intake during the adolescent growth spurt is crucial for adolescents to attain their full genetic potential for peak bone mass. One of the approaches to prevent osteoporosis is to maximize peak bone mass during the skeletal developmental stage (Lau *et al.*, 2004). There is, therefore, the need to promote the consumption of good food sources of calcium like milk, shrimps, crabs, anchovies and green leafy

vegetables on regular basis among senior high school students. Legumes are also good sources of calcium in the Ghanaian diet. Encouraging its consumption would help improve calcium intake.

### 3.2.3 Micronutrients

The mean iron intakes for both males and females were 9.1mg and 9.0mg, representing 118% and 113.9% respectively of the RNI. The higher intake of iron among the respondents was a positive outcome as iron deficiency can lead to anaemia and reduced physical growth. However, most of the iron was of plant sources hence bioavailability may be low. Zinc requirement was also not met by both sexes. Intakes of females and males were 6.1mg (82% of RNI) and 6.0 (72% of RNI) respectively. Zinc deficiency results in stunted growth and poor sexual development. There is the need to promote the consumption of animal foods which are rich sources of zinc in order to prevent zinc deficiency among adolescents. Rich dietary sources of zinc include red meat, organ meat, oysters, crab, beans and whole grain cereals which form part of the staples in Ghana.

Intake of vitamin A was low among both sexes. This could be due to the fact that palm oil and green leafy vegetables, which are good sources of pro-vitamin A were less consumed by the respondents. The mean daily intake for thiamine was 0.9 mg for both sexes, representing 81.8% and 53.8% of the RNI for males and females respectively. Riboflavin intake was 46.2% and 53.9% of the RNI for males and females respectively. This is a matter of great concern given the fact that these nutrients are involved in energy metabolism. To help curb the problem of inadequate intake of these vitamins, consumption of rich food sources such as liver, banana, soybeans, meat, fish, beans, cereals and whole nuts should be encouraged among the adolescents. Niacin intake was adequately met by both males and females with the males' intake slightly exceeding the RNI (102.5% and 100%). Intake for vitamin C was adequately met by both males (103%) and females (132%). Most of the respondents consumed oranges on daily basis. Adequate intake of the vitamin will enhance the absorption of non-heme iron from plant sources.

### 3.3 Conclusion and Recommendations

Based on the findings of the study, it is concluded that selection of food items from the major food groups among day senior high school students in Accra is low. As a result, their diet is low in energy and nutrients such as protein, calcium, zinc, vitamin A, thiamin and riboflavin. This is of much concern given the fact that adolescence is a stage of increased nutritional requirement due to rapid growth and development. Habitual inadequate intake might adversely affect their growth, development and nutrition. It is recommended that nutrition education programs should target adolescents in Senior High Schools in order to increase their knowledge on food nutrients and its importance to the body so as to ensure healthy eating.

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